

ZIMBABWE'S AGRICULTURAL REVOLUTION REVISITED

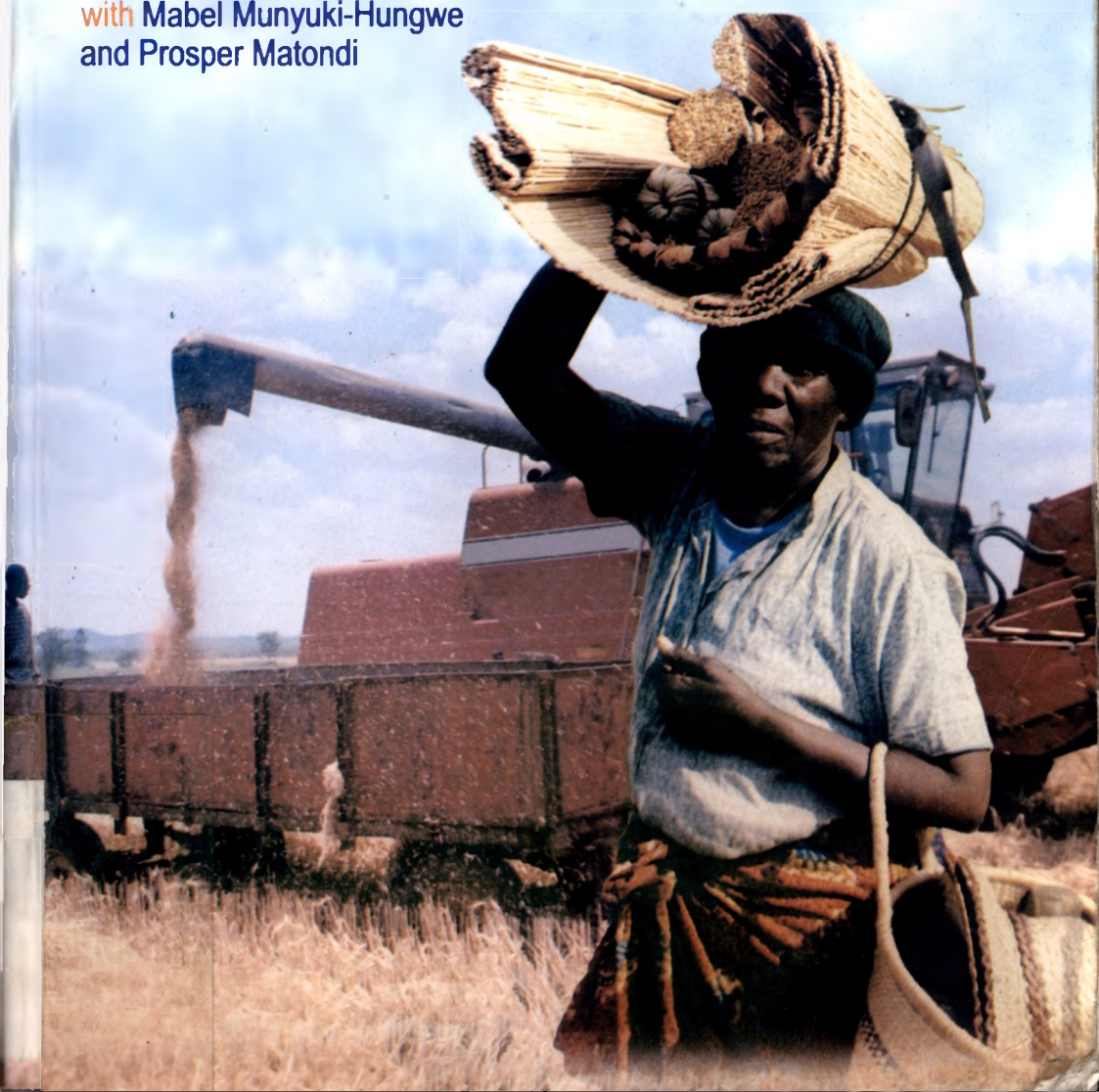
Edited By:

Mandivamba Rukuni,

Patrick Tawonezwi,

Carl Eicher

with Mabel Munyuki-Hungwe
and Prosper Matondi



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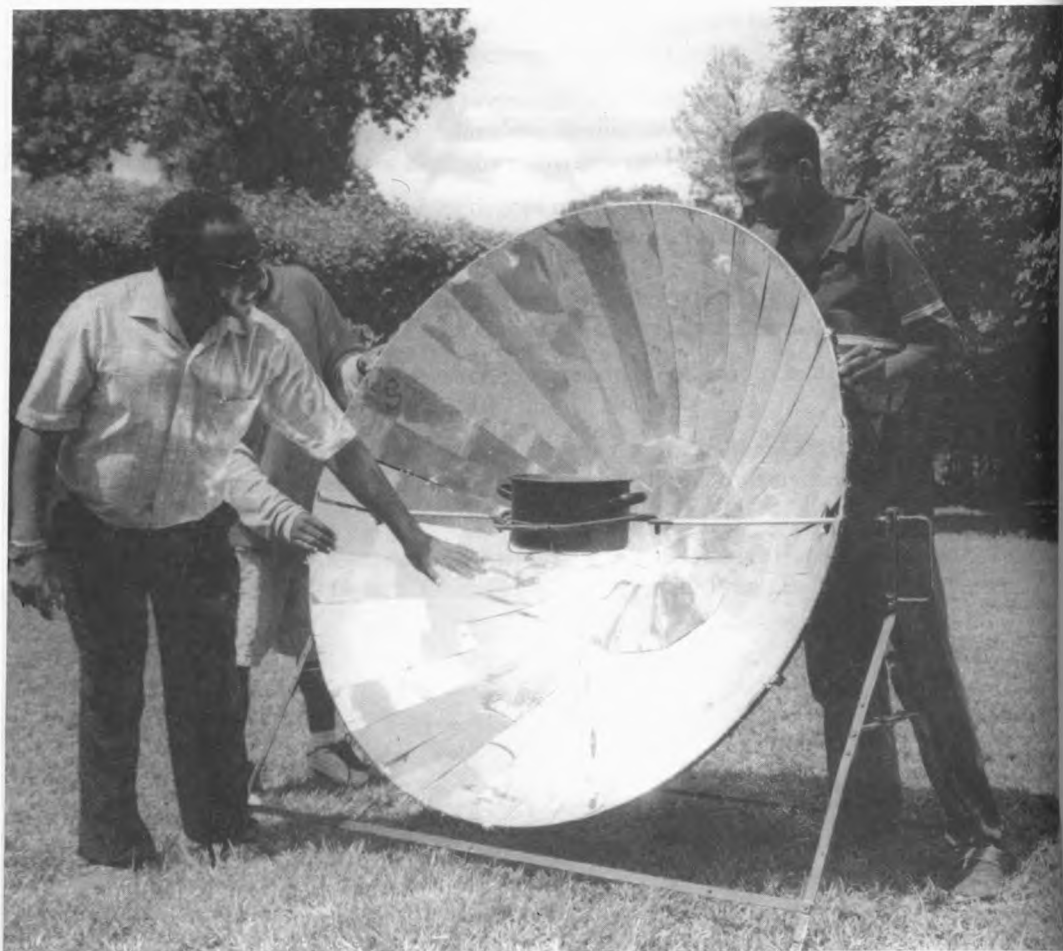
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The future of agriculture lies in appropriate research and development

Agricultural research policy

Patrick H. Tawonezwi and Danisile Hikwa

Agricultural research is recognized the world over as one of the major catalysts for the development of sustainable agriculture. Agricultural research has characteristics of a public good because much of the knowledge produced is for wider consumption. Therefore in ideal situations, most research should be funded by governments and other relevant stakeholders. Highly developed and industrialized countries still consider agricultural research as vitally important to continued progress and therefore do not leave research to markets alone. Zimbabwe was recognized for its strong agricultural industry and, in the 1980s, the country was widely praised for pursuing sound agricultural policies. Research played an important and critical role in the country's agricultural success. Development of agricultural research and its impact on the national economy before 1950 was discussed by Weinmann (1975). This chapter traces the historical development of agricultural research and research policies from 1948 to 2003, assesses the impact of new technology on national agricultural development, and suggests changes needed in agricultural research policy for the success of future research and development.

Status of research before UDI

The foundation of the present national research structure was laid in 1948 with the establishment of the former Department of Research and Specialist Services.¹¹⁹ The major reorganization of the then Ministry of Agriculture and Lands created several units with research gaining prominence. Until then, agricultural research was primarily concerned with testing imported livestock and crops for suitability to the local environment as well as development of new crop varieties. Trials were carried out to determine appropriate husbandry methods with considerable emphasis put on extension through demonstration farms and agricultural instruction. This was essential because a significant proportion of the white settlers had no farming experience (Weinmann, 1975). The orienta-

¹¹⁹ The Department of Research and Specialist Services fell under the Department of Agriculture which was established in 1903 to foster the development of the agriculture industry (Mudimu, 1986).

tion of research was targeted at the development of settler commercial agriculture based on modern husbandry methods.

Following the Second World War, there was a rapid increase in the white settler population (Weinmann, 1975). Land for settler expansion was becoming increasingly limited, thus increased production could no longer be achieved by simply extending the land frontiers. For this reason, there was need to institutionalize agricultural research and to develop technologies that increased crop yields and intensified production. The establishment of the Department of Research and Specialist Services in 1948 was an institutional innovation that enabled research to play its historic role in intensifying productivity on commercial farms (Department of Research and Specialist Services, 1969).

The Department of Research and Specialist Services consisted of eleven branches: tobacco; crop production; horticulture; botany and plant pathology; entomology; chemistry; animal husbandry; dairying; poultry; pasture research; and conservation and extension. In 1950, the branch of conservation and extension was set up as a separate department responsible for extension to serve commercial farmers. In the same year, the tobacco branch was taken over by the Tobacco Research Board, which had previously played a purely coordinating and advisory role but was now an independent statutory body responsible for all aspects of tobacco research (Weinmann, 1975). The Department of Research and Specialist Services remained the most important research organization in the country, undertaking research on all commodities except tobacco, tea, sugar, forestry, fish, pigs and animal diseases, which were researched by other relevant institutions.

In the period 1948–1965, crop research was primarily concerned with increasing maize, tobacco, cotton and wheat yields. Research topics included varietal testing and improvement, studies on moisture availability, soil fertility and fertilizer application rates, optimum plant population, planting dates, weed control, and insect and disease control (Rattray, 1969). Crop varieties from all over the world were tested, especially those from countries with an ecology and climate similar to that of Zimbabwe.

The impact of the Department of Research and Specialist Services research on national crop production was impressive. There was a five-fold increase in fertilizer usage between 1950 and 1965, compared with 50 per cent increase in area cropped during the same period. Table 8.1 shows the percentage increase in yields for specific crops between 1948 and the mid-1960s.

Early research on livestock breeding policy was based on the use of imported stock. In 1933 Romyn pointed out that cattle improvement was complicated by the fact that none of the imported beef breeds had proved adaptable to the country's ranching conditions and that there was lack of agreement as to the best breeding policy. He emphasized the need for a change in breeding policy away from the use of high-grade exotic stock. He also stressed the need to

Table 8.1: Percentage increases in yields per hectare between 1948 and mid-1960s

155	100	300	185	45	40	25	60
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Source: Annual reports from CSO

investigate the possibilities of evolving an indigenous or crossbred type of cattle more suited to local ranching conditions than the imported breeds.¹²⁰ A large-scale experiment was, therefore, initiated at Matopos Research Station in 1938 to define the most suitable breeding system for the improvement of exotic and indigenous cattle. The study was completed in 1961 and it confirmed the overall superiority of indigenous stock. Vorster (1964) concluded that livestock improvement in the ranching areas would be more permanent if local breeds instead of exotic stock were used as the basis for increased production.

In spite of the overwhelming evidence of the superiority of indigenous stock, production and research policy continued to favour the use of exotic stock for both beef cattle and other species. This was mainly due to lack of a clear national breeding policy and failure by both white commercial farmers and mostly white researchers to accept that the so-called improved breeds developed in Europe were not adapted to the local tropical environment. The negative attitude to indigenous stock was also supported by the general racist ideology of the colonial system which believed improvements could not be achieved locally. The argument was that the environment, rather than the exotic stock, should be changed! Consequently, research concentrated on improving the husbandry in order to make the environment suitable for the use of exotic stock. Use of indigenous stock and its promotion was left to the interest of a few enthusiasts who were often subjected to ridicule. Nevertheless, some work was done on indigenous stock and three breeds were developed: Mashona, Nguni and Tuli.¹²¹

Livestock research in the 1950s and early 1960s showed that the problem of weight loss resulting from poor quality rangeland during the dry season was the main cause of low reproductive rates in female stock and delayed attainment of market weight of slaughter stock (Elliott, 1969). Therefore, considerable research focused on development of dry-season feeding strategies. Between 1950 and the mid-1960s, beef off-take was estimated to have increased

¹²⁰ This recommendation was by the chief animal husbandry officer in his annual report of 1933 published in the *Rhodesia Agricultural Journal* No 31:302-309, 1934. A detailed account of research policy prior to 1950 is given in Weinmann (1975).

¹²¹ Harvey (1987) gives a detailed historical account of the development of indigenous breeds of cattle in Zimbabwe.

by 150 per cent per herd and calving rates increased from 49 to 60 per cent (Department of Research and Specialist Services, 1969).

Agricultural research during UDI

Until the Unilateral Declaration of Independence (UDI) in 1965, the core of commercial farming was based on tobacco production. However, when tobacco was affected by trade sanctions following UDI, a major policy change was made to diversify crop production away from tobacco. In 1966, the farm irrigation fund was established to assist farmers with crop diversification through irrigation support. Diversification was mainly into maize, cotton, wheat, soyabeans and beef production. In 1967, the agricultural diversification scheme was established specifically to assist tobacco farmers reduce or stop growing tobacco and move into other crops. Maize and cotton became the most important substitute crops at the time because other crops were less profitable than tobacco. However, by the late 1960s, the soyabean breeding programme had increased the yield of soyabean.¹²²

The diversification policy led to new demands on the national agricultural research system. In 1970, government established the Agricultural Research Council with strong representation from the Rhodesian National Farmers' Union. The Agricultural Research Council then was essentially an advisory body but it could not function efficiently under its original set-up and so it was re-structured. In 1976, the Agricultural Research Council assumed direct responsibility for research programmes, albeit in a complementary capacity with other government departments. It comprised ten members drawn from the Rhodesian National Farmers' Union, the directors of the Department of Research and Specialist Services, the Department of Conservation and Extension and the Tobacco Research Board, and representatives from the University of Zimbabwe (then University of Rhodesia) and agro-industry. Several agricultural producer associations provided grants for research activities to the council. Therefore its work was not backed financially by government alone.

Crop research

Research leading to the production of high-yielding hybrid varieties has been the main factor in the considerable increases in maize yields since the 1950s. The beneficial effect of maize hybrid use was further enhanced by research findings on fertilizer use, plant populations, early planting as well as pest and weed control measures (Tattersfield, 1982).

¹²² Identification of suitable strains of rhizobium inoculant for biological nitrogen fixation (BNF) by the soil productivity research laboratory of the Department of Research and Specialist Services, also greatly increased soyabean seed production from the 1970s.

The first major breakthrough in cotton research was in the mid-1960s with the development of effective pest and disease control technology.¹²³ Until then, the major disease and pest problems had been those related to jassid attacks and cotton lint staining caused by bollworm. Research on spraying techniques demonstrated that pest control could be economically achieved by application of insecticides. This breakthrough was followed by the development of varieties capable of increasing yield and producing high quality lint. Later, work on glandless, gossypol-free varieties was pursued together with breeding of new varieties for marginal rainfall areas of the country.

Winter wheat research yielded spectacular results. Between 1976 and 1981, Zimbabwe was becoming self-sufficient in wheat largely due to the development of short-strawed, lodging resistant high-yielding varieties with good resistance to diseases, particularly stem rust (Tattersfield, 1982). Some of these varieties were also capable of using high levels of fertilizer and had good baking qualities (Agricultural Research Council, 1981). Thus crop research contributed considerably towards crop diversification during the UDI period. Table 8.2 shows the overall positive impact of the diversification policy on the production of four major crops during the UDI period. Firstly, the area grown under maize, cotton and wheat increased while tobacco decreased. Secondly, yield per hectare increased in all the four crops grown primarily because of adoption by farmers of technologies generated through research (Agricultural Research Council, 1981; Tattersfield, 1982).

Livestock research

Until the mid-1960s, livestock production was centred in the drier regions of the country and little or no supplementary feeding was practised. As a result, reproductive rates were low and stock were slaughtered at 3.5 to 4.5 years for the market. Production methods changed considerably during the UDI period

Table 8.2: Yield trend of four major crops and area grown by commercial farmers 1961/65 to 1976/80 (1961/65 = 100)

Period	Maize		Flue-cured tobacco		Wheat		Cotton	
	Area	Yield/ha	Area	Yield/ha	Area	Yield/ha	Area	Yield/ha
1961/65	100	100	100	100	100	100	100	100
1966/70	138	129	61	108	940	142	952	117
1971/75	167	175	56	117	2,400	193	1,535	142
1976/80	131	160	54	133	3,700	213	1,611	145

Source: Adapted from CSO annual reports

¹²³ See chapter 13.

as recommendations from earlier research began to be adopted. Detailed research during the UDI period showed that supplementary feeding of cattle with protein-rich foods reduced body weight loss during the dry season and increased calving rates of breeding cows and weaning weights of progeny considerably. Research on and adoption of dry-season supplementary feeding made it possible to reduce the age at first mating of ranch heifers from over 3.5 years to 2.5 years and the age of steers slaughtered off-veld to 2.5 years from 3 to 4 years.

Diversification into cotton and soyabean production increased the availability of cottonseed and soyabean meal which became the main sources of supplementary protein in livestock feeding. This made production of the two crops and of livestock highly complementary and reduced dependence on the use of imported proteins. It was also demonstrated that urea could be used as a protein source in ruminant diets, thus further lowering the cost and making the practice of dry-season supplementation economically feasible. During the same period, research on pen-feeding cattle was initiated. In contrast to the high-roughage diets of the 1950s and early 1960s, the new pen-feeding rations were complete all-in high-energy diets containing high levels of concentrate (mainly maize) and as little roughage (typically 20 per cent) as was necessary for good digestion.

In the case of pen-fattening, market stock attained slaughter weight after 90 to 100 days in feedlots and animals were fattened for slaughter at a much younger age (1 to 2 years instead of 3 to 4 years). As the high energy feeding method was very simple, it led to the development of large-scale feedlot operations and to diversification particularly in the traditionally crop-growing parts of the country. Farmers in these areas had little or no experience with cattle and frequently adopted modern practices from the start (Agricultural Research Council, 1981). These technologies were adopted widely by farmers, albeit to different degrees (Bembridge, 1975). The net effect of adopting these technologies in addition to steady development in fencing, water supplies and improved husbandry practices in general, was the intensification of beef production (Agricultural Marketing Authority, 1976; Oliver, 1983).

Overall, the contribution of agricultural research to national development during UDI was enormous (Mudimu, 1986). It led to an increase in foreign exchange earnings, increased national employment capacity and food security, and enhanced the development of infrastructure in general.

Agricultural research policy: 1980–2003

The agricultural policy during the colonial period focused almost totally on the large-scale commercial farms owned by white farmers. The technology needs of black smallholder farmers were neglected. Furthermore, the technology generated in both crops and livestock was primarily based on exotic germplasm.

With the notable exception of groundnut research, little attempt was made to evaluate local indigenous genetic material. The pathway for development was considered to be through intensification of production. Hence research recommendations largely promoted capital-intensive production requiring large investments in machinery, use of chemicals and equipment. Such technology was generally not applicable to smallholder agriculture, although some spill-over research outputs did benefit farmers in this sector.

Change in research orientation to smallholders

The smallholder sector is highly complex and comprises an estimated 1.2 million rural families. These vary from subsistence dwellers to those who regard farming as a source of income in addition to being a source of food (Hikwa, Nyamudeza and Mashavira, 1999). With the change in policy after independence in favour of greater emphasis on the technological needs of the smallholder sector, research was faced with a major challenge and an expanded mandate to serve both agricultural sectors.

After independence in 1980, the new policy for agricultural research was based on the government's desire to promote smallholder farming, while maintaining or even increasing production in the large-scale commercial sector. The Department of Research and Specialist Services was expected to focus its research effort on this sector. Initially there was ambivalence, mainly amongst the older, predominantly-white researchers who held the view that problems in the smallholder sector were non-technical. Gradually, there was a shift towards acceptance of research responsibility by the Department of Research and Specialist Services to its major clientele, the smallholder sector, primarily because of the rapid increase in the number of black scientists who were more appreciative of the needs of smallholders. The development of strong research links with the international agricultural research centres also contributed to the change in orientation.

The Department of Research and Specialist Services responded to its expanded mandate in several ways. It acknowledged that smallholder producers were mixed farmers producing both crops and livestock. It was also noted that due to resource constraints within the department, not all stations would be in a position, at least initially, to satisfactorily execute on-farm research. Therefore the Farming Systems Research Unit was established to concentrate on on-farm research (Chigaru, 1984). It was also expected that individual stations and institutes would develop their programmes cognisant of the constraints identified by the unit. This new orientation saw the inception in the 1980/81 season of the communal area research trials programme (Agronomy Institute, 1983) and livestock breeding and management strategies suitable for the smallholder sector.

Priority setting

The government's recognition of the critical role of the agricultural sector in national development was first emphasized in the first five-year transnational development plan 1986-1990, which states that 'the agricultural sector must be in the centre of the development strategy' (Government of Zimbabwe, 1986). The plan recognized the potential for expansion in the production of indigenous small grains (sorghum and millets in drier areas) in view of their tolerance to drought. It also made specific reference to the need to promote production of horticultural crops because of their labour-intensive nature and hence ability 'to widen employment opportunities throughout the year and increase exports'. In the livestock subsector, promotion of the production of small ruminants and non-ruminants was seen as an important part of the strategy for rural development 'in view of the fact that small animals were owned by peasant farmers'. In the decade 1991-2000, various government policies further influenced agricultural research. In its document *Zimbabwe: a framework for economic reform 1991-1995* (Government of Zimbabwe, 1991) the government emphasized its goal of raising agricultural output to meet immediate household and local requirements, as well as 'the medium term growth target of 3.2 per cent per annum'. In response to the government's policy framework, in 1992 the then Ministry of Lands, Agriculture and Rural Resettlement started producing more detailed written agricultural policy statements than previously. The aim was to articulate clearly government's agricultural policy framework to all stakeholders, including research institutions. In addition to the various policy statements issued every year by the Minister of Agriculture, the ministry also produced its own policy framework document, *Zimbabwe's agricultural policy framework 1995-2020* (Government of Zimbabwe, 1995). Strategies outlined in the document included commercialization of smallholder agriculture through increased product output and economic returns from crop and livestock production, and development of sustainable farming systems that reversed current land degradation and reduced soil erosion.

In view of these policy directions, it is necessary to examine how the national agricultural research system, particularly the Department of Research and Specialist Services, formulated its research priorities over time. Chigaru (1984) observed that the department's programme formulation tended to be *ad hoc* rather than systematic because there was no objective procedure to assess research priorities. In the absence of a clearly articulated blueprint on research policy, priorities and strategies by the directorate, individual researchers and institutes within the department formulated research strategies and programmes according to their own preferences and perception of priorities and problems.

The Department of Research and Specialist Services recognized the need for a comprehensive strategy to implement its post-independence mandate. Consequently, in response to changes in policy, it drew up proposals to address the

weaknesses through structural reorganization of the department, strengthening the research planning and priority setting process and adopting nationally co-ordinated research programmes (Department of Research and Specialist Services/ISNAR, 1988). In 1986, the committee for on-farm research and extension, comprising members from the Department of Research and Specialist Services and the Department of Agricultural, Technical and Extension Services, was established to strengthen planning and priority setting. Its main objectives were to enhance the research priority setting process and strengthen links for effective technology delivery to farmers by the two departments. Through its series of commodity subcommittees, the committee for on-farm research and extension evaluated the relevance of all project proposals for on-farm research and dissemination before they were implemented, and monitored the progress of those projects established. It also advised on priority areas and appropriate methodology for both on-farm and on-station research. Where technology already existed, appropriate demonstrations were recommended to the Department of Agricultural, Technical and Extension Services.¹²⁴ Despite visible progress made by the committee, it lacked direct and consistent funding and was scrapped in the early 1990s, thus weakening the effective links that had been created by research and extension services in the 1980s.

In 1997, the Department of Research and Specialist Services embarked on formulating a strategic plan through wide consultations with stakeholders in the private sector, universities and in the commercial farming sector. As input into the plan, rapid rural appraisals were conducted on smallholder farms in all agro-ecological zones of Zimbabwe. Major problems affecting both crop and livestock production in the smallholder sector were identified during group discussions with farmers and from secondary data collected by extension agents in the districts. The information collected allowed the department to develop a strategic plan that served as a policy framework for consolidating, guiding and focusing resource allocation in strategic research areas.

Following recommendations by a task force to the Minister of Agriculture, the Agricultural Research Council was re-engineered in 1997 (Agricultural Research Council, 1997). In addition to the roles given to the Council by the Act of Parliament that established it in 1970, the re-engineered Agricultural Research Council drew up a five-year rolling strategic plan (1999–2004) and created an agricultural research and extension fund. Through a stakeholder consultative process, the Council came up with broad thematic research and development areas based on a priority setting process in each province of the

¹²⁴ Department of Research and Specialist Services/Department of Agricultural, Technical and Extension Services (1987) gives details of suggested priorities for on-farm research and demonstrations in natural regions III, IV and V. The departments (1988) address constraints and priorities for on-farm research and extension in the livestock subsector.

country (Agricultural Research Council, 2000). The agricultural research and extension fund is open to researchers and extension agents who propose projects that draw on the broad themes and also meet the criteria set down in the Council's operating manual of 2000. The manual stipulates the structure of proposals for funding, selection criteria and processes, size of funds that can be granted and their management, monitoring and reporting structure (Agricultural Research Council, 2000). The re-engineered Agricultural Research Council is able to work with various research and development organizations in project proposal development and in sourcing funds.

Thus the changes in orientation and priorities after independence led to important changes in research focus, in technology development and implementation over time. The establishment of the committee for on-farm research and extension and farming systems research units assisted in focusing on research priorities of smallholders and specific problems in the arid and semi-arid regions of the country. The communal area research trials of the Agronomy Research Institute exposed farmers in all the country's eight provinces to new crops and varieties that were normally not grown in these areas. New cash and food crops, such as cassava and castor, meant for marginal areas were introduced into the agronomy research programmes. There was also a shift in crop breeding programmes to include indigenous small grains (sorghum and millets) and indigenous grain legumes (cow pea and bambara nut) neglected in the past. New white dent cultivars of sorghum (SV1 and SV2) and pearl millet (PMV1) were released in the 1980s. In 1996, a short-duration high-yielding cowpea variety (CBC-1) was released, followed by releases of two more varieties (CBC-2 and CBC-3) in 2003, as well as bambara nut varieties 'kazuma' and 'mana' in the same year.

The escalation in cost of hybrid seed from 2000 encouraged government to reconsider the use of open-pollinated maize varieties in the smallholder sector. Research responded by testing a range of open-pollinated varieties to select the best varieties for bulking and distribution to farmers. Preliminary data collected in eastern and southern Africa, including Zimbabwe (Vivek, Banziger and Pixley, 2001), enabled Zimbabwean researchers to select a few promising varieties for further testing in all natural regions of the country to capture farmer perceptions. The impact of including open-pollinated maize varieties in hybrid-maize seed development and production and the maize seed industry in general will only be assessed once the open-pollinated varieties have been taken out to farmers for full-scale production.

In the livestock subsector, research on the role, nutritive value and use of crop by-products as ruminant feed led to awareness of the need to conserve crop residues and the interdependence between crop production and livestock rearing in smallholder agriculture. In order to improve the feed base, various research approaches were adopted, including the use of planted pastures and

agroforestry as well as fodder banks, especially by smallholder dairy farmers. Secondly, research on breed evaluation confirmed the overall superiority of indigenous cattle and sheep over exotic types for meat production (Tawonezvi, Ward, Trail and Light, 1988; Tawonezvi, Khombe and Ward, 1988; Moyo, 1990) and the potential for selective improvement within indigenous cattle (Tawonezvi *et al.*, 1986; Tawonezvi, 1989). Extension policy then moved away from recommending the use of exotic breeding stock in smallholder areas where controlled mating was not possible. However, the absence of adequate numbers of indigenous stock due to droughts and the consequent restocking with exotic animals tended to undermine this policy (Tawonezvi, 1999) and more needs to be done to conserve indigenous breeds.

Building and maintaining agricultural research capacity

The success of agricultural research in Zimbabwe during UDI and earlier can be attributed to a number of factors. Firstly, long-term programmes were started and maintained with little disruption. For example, the maize-breeding programme has existed since the early 1930s. Similarly, the livestock-breeding programme started in 1938 was completed in 1961. The genotype x environment interaction study initiated in 1957 at Matopos was completed in 1999. Secondly, response by commercial farmers to technology generated was largely favourable because of strong input on the type of research they required. In addition to this, strong research–extension linkages, both formal and informal, were developed over time (Department of Research and Specialist Services/ISNAR, 1988). Thirdly, government support for agricultural research was strong and consistent.

Following independence, the massive resignation of experienced white researchers and technical staff was followed by hiring mainly young and inexperienced black Zimbabweans. The Department of Research and Specialist Services faced the major task of developing the research skills of the new staff as rapidly as possible. After some initial hesitation, the department committed itself to focusing on postgraduate training and from the mid-1980s to 1990, about 10 to 15 professional staff completed Masters of Science degrees each year with funding from the British Council. Researchers with Masters degrees were encouraged to pursue DPhil and PhD degrees at the University of Zimbabwe. From 1992, support for staff training was enhanced. For example, the Department of Research and Specialist Services negotiated with the Rockefeller Foundation for training support at PhD level for a ten-year period (1993–2002) for researchers in crop production. At least eight researchers had benefited from this arrangement by 1999. Unfortunately, the researchers tended to be attracted abroad or by the private sector once they had completed their studies.

Although these policies have been effective in rebuilding the professional

cadres in the Department of Research and Specialist Services, the institutional capacity remains inadequate to meet the challenges brought about by the change in research policy after independence. The sudden expansion in the research mandate to cover smallholder agriculture was not matched with a corresponding increase in the number of research scientists and with adequate budget support. Consequently, the human resource capacity tended to be inadequate for effective execution of research in various programmes (Department of Research and Specialist Services/ISNAR, 1988). The situation was further compounded by a high staff turnover in the 1990s due mainly to two reasons. Firstly, there was a decline in real value of government resources committed to the Department of Research and Specialist Services. By 1995, the budget in real (inflation adjusted) terms was 35 per cent lower than the expenditure in 1980 (Agricultural Research Council, 1995). At the same time the proportion of the recurrent expenditure committed to salaries and overheads increased to 91 per cent, leaving only 9 per cent devoted to actual research activities. With such a decline in research funding in real terms, the first area to suffer was the on-farm adaptive research because of its high demand in inputs, particularly transport, subsistence and travel. Capital development expenditure declined to less than 5 per cent of the department's requirements, affecting maintenance and improvement of research infrastructure.

Secondly, compared with the previous flexibility enjoyed by the department through the Agricultural Research Council, it was forced to depend on service ministries for services such as transport, procurement and fund disbursement for their operations. The net result was a loss of experienced staff. The general vacancy freeze from the mid-1990s by the Public Service Commission meant that the department could not replace staff immediately but had to be involved in long and protracted negotiations to fill vacancies. It took anything up to two years (sometimes more) to fill a research officer vacancy. The inability to retain experienced staff was a direct negation of government's policy to improve productivity in the smallholder sector.

By the end of the 1990s, meaningful research programmes were sustained largely with assistance from donors. Although the ability to source extra funds for research is desirable, over-reliance on donor funds can be detrimental to national research programmes in terms of focusing on national policies and priorities. The agricultural revolving fund, set up by the Audit and Exchequer Act of 1999 was launched in May 1999 by the Ministry of Lands, Agriculture and Rural Resettlement. For the Department of Research and Specialist Services, the extra funds were supposed to significantly improve research and service delivery to farmers given the limitations in the distribution and use of the revenue by the various research stations and institutes.

One of the weaknesses inherited from UDI was that the research facilities and activities were concentrated in the higher-potential agricultural regions. This structure was not appropriate to meet the research needs of smallholder

farmers in marginal areas, the major clientele for research after independence. The department sought to address this issue by opening new sites at Mlezu Agricultural College (natural region III) and rebuilding the Save Valley Experiment Station (natural region V) using public sector investment funds.

Implications for the future

For some time, the housing of public research and extension services in two separate departments has been considered a weak link and an impediment to service delivery to smallholder farmers. This became more apparent following the land reform programme which resulted in an increased number of farmers settled under both the A1 (smallholder) and the A2 (commercial) resettlement models. In an effort to strengthen delivery of research and extension services, the Ministry of Agriculture and Rural Development decided to merge the Department of Agricultural, Technical and Extension Services and Department of Research and Specialist Services in 2002. The Department of Agricultural Research and Extension was created as well as three other separate departments of livestock production and development,¹²⁵ agricultural engineering and irrigation. However, the fundamental problem in service delivery to the farming community was the shortage of funding. The new institutional structures needed to be matched with reasonable and consistent levels of funding, sound planning and priority setting, and results-based monitoring. The decline in government support to public-sector research from the late 1990s reversed some of the gains in agricultural development, particularly in the smallholder sector. The resuscitation of key institutions from 2000 required a review of the former strategic plans of the two departments in order to come up with new plans to match the nation's new research-extension strategy.

Therefore, to achieve government's targets in agricultural and rural development, sustained government commitment to support agricultural research will be crucial. The crafted strategic plans should be able to guide public research services which may give the departments greater visibility and attract more research funds. The plans should be reviewed periodically in keeping with national development targets. An overall national research policy blueprint which provides guidelines on the roles of public and private research and the contribution of international agricultural research centres will still be necessary.

Moreover, the notion that all research must be vested within public institutions should be revisited. It is necessary now more than ever to involve universities, the private sector and farmers in order for research to be demand-driven. There must be collaborative efforts between researchers at the University of

¹²⁵ See chapter 8 for more details on the merger of public research and extension services.

Zimbabwe, Africa University and other tertiary colleges. For research to be sustainable, the new farmers must pay for services offered by the Department of Agricultural Research and Extension and also channel a percentage of resources for research through their unions.

A broad consensus exists on the future priority areas for both crops and livestock research in Zimbabwe. The need for continued research and emphasis on maize, wheat, sorghum and millet, oilseeds (groundnuts, soyabeans sunflower) and horticultural crops has been recognized in various government policy documents. Livestock research has an important role to play in providing the technology to sustain production of meat and milk to meet the expected increase in demand as the population increases, as well as for exports. Wildlife production and marketing activities also require attention.

Conclusion

The success of agriculture in Zimbabwe is primarily a result of the massive investment in the prime movers over a period of many decades. During the colonial era, an impressive research system was developed to generate the type of technology required to enhance intensive and diversified production in the large-scale commercial sector. To ensure appropriateness of this research, there was strong farmer and extension participation in the formulation of research priorities and strategies. These aspects were strengthened and consolidated further during the UDI period with the establishment of the Agricultural Research Council and the restructuring of Department of Research and Specialist Services. This was coupled with the development of a cadre of highly experienced professional scientists and technical staff with excellent research facilities. The successes, particularly in maize, wheat, tobacco, cotton, soyabean and beef research in Zimbabwe, showed that significant and sustained long-term investment in physical and human capital was critical to the development of local technologies. Research conducted during this period proved that, given a political will and the necessary resources, the right technologies could be developed to deal with economic and environmental realities. The area cropped to tobacco decreased but yield per hectare continued to increase, showing that diversification from tobacco was accompanied by intensive production of other major crops.

Livestock research during the colonial period also provided sound technologies for the large-scale commercial farming sector with emphasis on beef production. The period witnessed major technological advances, particularly in animal nutrition, which led to the development of supplementary feeding systems and the establishment of large-scale feedlot enterprises. The feeding technologies developed were based on the use of high protein (mainly cotton and soyabean) meal and high-energy (mainly maize) diets. In this way, research

advances in crop and livestock production were highly complementary and the use of locally produced stockfeeds reduced the dependence on imported proteins.

While these achievements were impressive and highly successful in the service of the large-scale commercial sector, the neglect of the technological needs of black smallholder farmers was clearly the most retrogressive policy of the colonial period. Furthermore, the technologies generated for the large-scale commercial sector were largely for the high rainfall regions and were high-input oriented. Since the bulk of smallholder area producers were located in low rainfall areas, such technologies were of little value to them. This effectively excluded smallholder farmers from going into commercial production until the situation was redressed after independence in 1980. Another consequence of this neglect was that traditional crops grown by smallholder farmers and more suitable for their marginal rainfall areas were not researched. Similarly, research on indigenous livestock was limited and no livestock breeding or feeding technologies were developed which were suitable for smallholder agriculture. Thus the agricultural revolution experienced before independence was limited to the large-scale commercial sector. However, some spill-over research benefited smallholder farmers, particularly that relating to the development of drought-tolerant maize and cotton varieties. This contributed to the well-known maize and cotton success stories in smallholder agriculture following policy change after independence. This success clearly showed that given economic incentives and appropriate technologies, smallholder farmers can be a major force in agricultural development.

However, due to the complexity of the smallholder sector, various research approaches were tested in an effort to increase adoption of technologies, including the farming systems approach that dominated the 1980s. Attempts by the Department of Agricultural Research and Extension to address the technological needs of smallholder farmers took several stages. Much work on farms was done with varying degrees of farmer participation.

Initially on-farm surveys were conducted to identify production constraints. The surveys highlighted the multiple functions of livestock, particularly cattle, and the complementarity between crop and livestock production. Although these functions and relationships were generally known to exist, the surveys enabled their relative importance to be identified. The new research orientation also recognized that smallholder farmers were by and large mixed farmers and highlighted the need for adaptive approaches by the Farming Systems Research Unit supported by applied research generated on-station. The participatory technology development approach, though expensive, might hold the key to the success of future research programmes as well as eventual adoption of technologies by smallholders. There is a need, however, to assess the strengths and weaknesses of the participatory philosophy and fine-tune the methodologies to

be more responsive to the needs of farmers. While research will continue to be a primary source of information for both crop and livestock production, there is need to juxtapose this with research that supports policy formulation. To achieve the latter, the recruitment policy into agricultural research has to consider including sociologists or anthropologists and agricultural economists. The effectiveness of the Department of Agricultural Research and Extension research in these endeavours has been somewhat limited by the current research structure which was never intended to serve the smallholder sector.

The department has executed its expanded mandate well considering the resources at its disposal; and has maintained its tradition of high professional standards of research. This in itself is a significant achievement. However, the decline in real budgetary support in recent years has jeopardized research in smallholder agriculture and this will have long-term effects. There is, therefore, a need to promote agricultural research among politicians, policy-makers and the general public and convince them of the need to give sustained support to agricultural research. To this end, the Department of Agricultural Research and Extension is reviewing the blueprint strategic plan document to guide research and it is envisaged that this will give the department greater visibility and therefore enhanced funding from key stakeholders. To enhance resource availability, revenue retention by departments in the Ministry of Agriculture and Rural Development was launched in 1999, through commercialization of certain services and creation of revolving funds. The extra funds are expected to improve service delivery to farmers as long as the government continues to allocate additional funds to adequately cover overheads, salaries and non-revenue generating but essential services. On-farm research is essential given the mandate of the national agricultural research system but it is expensive as it involves extensive travel. For on-farm research to be successful, consistent and effective, adequate and reliable funding is therefore necessary. With adequate funding, sound planning, priority setting and results-based monitoring, the new Department of Agricultural Research and Extension should be able to service the farmers well in the new millennium.

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